

The opinion in support of the decision being entered today
is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JONAH A. HARLEY and STORRS T. HOEN

Appeal 2007-3048
Application 10/664,947
Technology Center 2800

Decided: September 10, 2007

Before LANCE LEONARD BARRY, ANITA PELLMAN GROSS, and
MAHSHID D. SAADAT, *Administrative Patent Judges*.

BARRY, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF THE CASE

A Patent Examiner rejected claims 1 and 3-24. The Appellants appeal therefrom under 35 U.S.C. § 134(a). We have jurisdiction under 35 U.S.C. § 6(b).

A. INVENTION

The invention at issue on appeal is an electrostatic actuator. A microelectromechanical system ("MEMS") often uses electrostatic actuators to position optical devices and switches and to turn gears. Such actuators are particularly useful for generating a low-to-moderate force. (Specification 1.)

One design for an electrostatic actuator is the "comb drive actuator," the name of which derives from the actuator's physical resemblance to a comb. Comb drive actuators have a stationary element and an element that moves relative thereto. The Appellants refer to the stationary element as a "stator;" the moveable element, a "rotor." The term "rotor" implies no rotational motion, however; in a common application of such an actuator, the rotor moves linearly in a plane parallel to a plane occupied by the stator. (*Id.* 2.)

The Appellants explain that conventional comb drive actuators provide analog positioning in which the positioning varies continuously with the applied voltage. Accurate positioning of such an actuator requires controlling the voltage with high precision. (*Id.* 4.)

Figure 3A of the Specification shows their stator 310. As shown therein, each of three stator conductors 318 connects to every third stator electrode 316 in an electrode array 315. A high voltage is applied to some of the electrodes, and a low voltage is applied to the other electrodes.

As shown in Figure 4 of the Specification, the application of the voltages creates a "spatially substantially alternating" voltage pattern on the stator. Changing the spatially substantially alternating voltage pattern on the stator causes the associated rotor 320 to translate in discrete, precisely controllable steps in the +x- and -x directions. (*Id.* 9.)

B. ILLUSTRATIVE CLAIM

Claim 14, which further illustrates the invention, follows:

14. An electrostatic stepping comb drive actuator, comprising:

 a stationary member having a tooth, the tooth comprising:

 opposed surfaces, and

 a first electrode array disposed on the first surfaces;¹

 a first conductor coupled to the first electrode array;

 a moveable member comprising second electrode arrays disposed on surfaces opposite the first surfaces; and

 second conductors electrically connected to the second electrode arrays, and

 voltage sources that impose discrete voltage patterns on the first and the second electrode arrays.

¹ A claim is indefinite "where the language 'said lever' appears in a dependent claim where no such 'lever' has been previously recited in a parent claim to that dependent claim" *Ex parte Moelands*, 3 USPQ2d 1474, 1476 (BPAI 1987). Here, although claim 14 includes the language "the first surfaces," no such "first surfaces" were previously recited therein. Being "basically a board of review," *Ex parte Gambogi*, 62 USPQ2d 1209, 1211 (BPAI 2001), we leave the issue of whether the claim lacks antecedent basis to the Examiner and the Appellants.

C. REJECTIONS

Claims 1, 3-7, 9, 14-17, 22, and 23 stand rejected under 35 U.S.C. § 103(a) as obvious over Japanese Patent Application Publication No. 07-274540 ("Higuchi") and U.S. Patent No. 5,869,916 ("Suzuki-916"). Claims 8, 10-12, and 18-21 stand rejected under § 103(a) as obvious over Higuchi; Suzuki-916; and Japanese Patent Application Publication No. 08-186,987 ("Suzuki-987"). Claims 13 and 24 stand rejected under § 103(a) as obvious over Higuchi; Suzuki-916; and U.S. Patent No. 5,986,381 ("Hoen").

III. ISSUE

"Rather than reiterate the positions of parties *in toto*, we focus on the issue therebetween." *Ex Parte Filatov*, No. 2006-1160, 2007 WL 1317144, at *2 (BPAI 2007). The Examiner admits that Higuchi does not teach "the discrete voltage patterns" of the claims. (Sub. Answer² 4.) Finding that "Suzuki-916 teaches an DC (discrete) driving voltages," (*id.* 5) he asserts, "Suzuki provides literal motivation to combine the references on col. 10, lines 37-58, particularly line 51, where the DC Voltage to provide five types of combinations in polarities and voltages to control the movement of the mover left and right in a smooth movement." (*Id.* 9.) The Appellants argue, "Since Higuchi already uses an AC voltage pattern that produces a smooth movement, there is no need and hence no motivation to replace the AC

² We rely on and refer to the Substitute Examiner's Answer, in lieu of the original Examiner's Answer, because the latter was defective. The original was not considered in deciding this appeal.

voltage of Higuchi with the DC voltages of Suzuki-916." (Br. 13.)
Therefore, the issue is whether the Examiner has identified a persuasive reason to replace Higuchi's alternating current ("AC") voltage with a direct current ("DC") voltage.

IV. LAW

"[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." *KSR Int'l v. Teleflex Inc.*, 127 S.Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (2007). "[T]here must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006) (citing *In re Lee*, 277 F.3d 1338, 1343-46 (Fed. Cir. 2002); *In re Rouffet*, 149 F.3d 1350, 1355-59 (Fed. Cir. 1998)).

V. ANALYSIS

Here, Higuchi "relates to a layered-type electrostatic motor driven by a 3-phase alternating current. . . ." (Higuchi Translation 7.) More specifically, "a 3-phase alternating current voltage is applied thereto using a 3-phase alternating current power supply. . . ." (*Id.* 17-18.)

For its part, contrary to the Examiner's assertions, (Answer 10), Suzuki-916 recognizes that driving a motor with an AC voltage results in

smooth movement of the motor. Specifically, the latter reference includes the following disclosure.

[T]he waveform of the voltages applied to the electrodes 30a, 30b of the stator element 22 is in the wave-like form having smoothly-inclined curves in the rise portion a and the fall portion b. Hence, even where the voltage is switched from "0" to "+" or "-" or the voltage is changed from "+" or "-" to "0", the switching is smoothly performed. Consequently, **the driving force for the movable element 21 is smoothly varied** upon switching over of the voltages applied to the electrodes. .

..

(Col. 16, ll. 32-41 (emphasis added).)

Because Higuchi's AC voltage already produces a smooth movement, we are unpersuaded of the need to replace the AC voltage with a DC voltage "to provide a smooth movement. . . ." (Answer 5.) The Examiner does not allege, let alone show, that the addition of Suzuki-987 or Hoen cures the aforementioned deficiency.

VI. CONCLUSION

Because the Examiner has not identified a persuasive reason to replace Higuchi's AC voltage with a DC voltage, we reverse the rejections of claims 1 and 3-24.

VII. ADDITIONAL OBSERVATIONS

We cannot help but notice the similarity of Suzuki-916 to the claimed invention. Although Figure 1 of the reference arguably shows only a single rotor tooth, the Appellants have admitted that "[c]urrent, practical comb

drive actuators typically require between 10 and 200 teeth to generate enough force for a MEMS device." (Specification 3.) Being a board that

"review[s] . . . rejections made by patent examiners," *Gambogi*, 62 USPQ2d 1209 at 1211, however, we leave the issue of whether any of the claims would have been obvious over Suzuki-916 and the Appellants' admitted prior art to the Examiner.

REVERSED

APJ Initials:

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